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% "56GHF57H The objective of this project is to develop and pilot an internet-delivered parent training program for caregivers of children with autism spectrum disorders (ASD). The intervention will be based on an evidence-based curriculum that uses a blend of developmental and behavioral intervention strategies during daily routines and activities. In the second phase of the project (Years 2 and 3), the focus is on pilot testing two delivery methods for the online parent training program: 1) self-administered only and 2) self-administered plus remote coaching to examine their feasibility, acceptability, and usability. We have enrolled 22 participants (out of 30) and data collection is underway. Preliminary data analyses support the feasibility of the program. Parents in both groups exhibit high rates of program engagement, high levels of program satisfaction, and gains in conceptual intervention knowledge and fidelity of implementation of the intervention with their child. Parents in the self-administered plus remote coaching group demonstrated greater levels of program engagement and program satisfaction.				
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INTRODUCTION

Research indicates that early and intensive intervention can lead to significant improvement in long term outcomes for children with ASD. However, the growing numbers of young children with ASD and their significant educational needs make it a challenge for public agencies to provide services at the needed level of intensity. Parent training is a cost-effective approach to intervention that can improve child outcomes by increasing the number of hours of intervention a child with ASD receives. Parent training has also been shown to decrease parent stress and depression. Although parent training is considered an essential component of early intervention programs for children with ASD, it is rarely provided in community-based early intervention settings due to a lack of appropriately-trained providers. Further, effective parent training programs for children with ASD require frequent parent coaching by a therapist. Thus, the absence of reliable transportation, lack of child care, cost of treatment, and limited flexibility in scheduling, can significantly affect access to these services. These barriers are particularly a problem in rural and underserved areas. The development of more sophisticated technology has created the opportunity for distance learning of intervention strategies. Thus, the objective of this project is to develop and pilot an internet-delivered parent training program for caregivers of children with ASD. The intervention will be based on an evidence-based curriculum that uses a blend of developmental and behavioral intervention strategies during daily routines and activities. In the first phase of the project (Year 1), we will develop the online parent training program. This will require modify an existing evidence-based parent training curriculum to be delivered over the internet in 12, self-administered modules containing the intervention content. In addition, we will determine the best method for providing remote coaching to parents. The development of the online program will be guided by feedback from 2 focus groups with parents, intervention providers, and program administrators. In the second phase of the project (Years 2 and 3), we will formatively evaluate the acceptability, usability and implementation feasibility of two delivery formats of the program to

determine the most effective delivery method and use feedback to further refine the program. We will randomly assign families to receive the self-administered modules only (n=15) or the self-administered modules and remote, video-based coaching from a trainer (n=15). At the conclusion of their participation in the program, parents will complete measures of comprehension of program content and treatment acceptability/satisfaction. We will also assess parent program engagement and parent fidelity of implementation. We expect that the results will reveal that internet-based instruction will be a feasible method for training parents of children with ASD in evidence-based intervention strategies, and will thus enhance dissemination of evidence-based practices to underserved populations. If the program is found to be feasible, the next step will be to obtain an R01 to conduct a randomized controlled trial of the intervention to determine its efficacy.

BODY

The goal for Year 3 was to complete pilot testing of the two versions of the program with families. As mentioned in previous reports, during the program development phase (Year 1) we decided to make a significant change to the delivery platform for the self-directed portion of the program. This change allowed for much more flexibility in content delivery and the integration of the program elements into a single interface, enhancing usability. However, it required significant programming and beta testing, which put us behind our proposed timeline. Thus, we did not begin full implementation of the feasibility trial until Year 3. Thus far, we have enrolled a little over 2/3 of our proposed sample (22 participants). We were granted a no-cost extension in order to complete the feasibility trial and will be collecting data from an additional 8 to 10 families over the next 9 months. Below, we detail our progress on each of our proposed tasks thus far. For tasks that were completed in a previous reporting period, we provide only a brief summary of our findings.

Specific Aim 1: Modify an evidence-based parent training curriculum to be delivered over the internet

1a. Create 12, self-administered modules containing the intervention content to be delivered over the internet (months 1-8). Curriculum modification will involve: 1) modifying the content of the slide presentations which describes the intervention techniques; 2) developing and recording audio text to accompany the slide presentations; 3) developing comprehension check questions; 4) modifying homework assignments to be consistent with the modules; and 5) developing an online systems training module to help parents navigate the program and upload video.

We fully designed the curriculum content and modified it to be delivered over the internet in 12 modules. Of note, we made a number of additional modifications so that the program could be completely self-administered. These included: 1) redesigning some of the curriculum content so that it could be completed independently by the user (i.e., without the aid of a coach); 2) developing a significant amount of additional content to enhance learning in a self-administered format; and 3) developing our own interactive web application and data collection system to deliver the self-administered modules. Please see Appendix A for a complete description of the web application with

screenshots.

1b. Conduct series of 2 focus groups with parents, intervention providers, and program administrators to obtain information on key elements of the program (months 4-8). We will conduct two focus groups with 8-10 key stakeholders to gain feedback on the structural elements of the program. Focus group members will participate in two focus groups, three months apart. In the first focus group, we will obtain feedback on the structure of the online systems training and self-administered modules. In the first focus group, we will obtain feedback on the structure of the online systems training and self-administered modules. In the second focus group, we will present the modifications to the online systems training and self-administered modules that we made in response to feedback from the first group. We will then obtain additional feedback on these modifications. We will also collect feedback on the remote coaching component of the program. Feedback from focus group members will be integrated and incorporated into the final program.

We conducted the first focus groups with 4 professionals and 4 parents of children with ASD in April 2011 and the second focus group with a subset of the participants from the first focus group (3 professionals and 1 parent) in March 2012. In the first focus group, participants were shown a beta version of one module the self-administered portion of the program and were asked to comment on the program components and user interface. Their feedback was used in the design of the completed self-administered program. In the second focus group, participants were given access to the self-administered program and were asked to comment on the extent to which they felt that the program would achieve its aims, barriers to using the program, what type of children and families would be the most likely to benefit from the program, and how the program should be disseminated. We also asked participants to comment on the remote coaching portion of the program. Key themes identified from the focus group analysis included: 1) The program would likely achieve its aims; 2) the program would be appropriate for a range of families; 3) children with significant behavioral difficulties and parents who do not believe that they can help their child gain skills may not benefit as well as others; 4) pediatricians' or physicians' offices, diagnostic centers, and educational providers would be the most likely professionals to recommend the program to families; 5) limit parental time, accountability, access to technology, and lack of having a professional help the parent through the program could be barriers

to the use of self-administered program; 6) having parents work with a behavioral expert to address child behavior problems prior to completing the program, offering the self-administered program in combination with a regular parent group to increase accountability and social support, and having a local subject matter expert available who could answer parents' questions as they worked through the program could address these barriers; 7) technical difficulties with video-conferencing software, parental discomfort with video-conferencing, and not having the coach be able to work directly with the child while the parent observed could be barriers to the use of remote coaching; and 8) having parents observe a sample coaching session prior to having their first coaching session, providing coaching over the phone instead of video-conferencing, or providing coaching based on previously recorded videos of the parent and child as opposed to coaching the parents as they interact with their child could address these barriers.

1c. Make refinements to program based on feedback (months 9-12). We will make final modifications to the program based on feedback obtained from the focus groups. At this point, we will assess whether the program needs to be significantly altered based on feedback from the focus groups. Although we plan to incorporate feedback on the program and assessment protocol throughout this phase of the project, we may find that significant alterations to the delivery format need to be made prior to beginning the pilot study. We will evaluate this possibility at this point and will make adjustments to the timeline accordingly.

We used the feedback obtained from the first focus group to guide the development of the self-administered program. The second focus group was conducted to obtain feedback on the completed self-administered program. Participant feedback suggested that final self-administered program would be likely to achieve its intended goals and no additional changes to the content or format of the self-administered portion of program were identified. Based on feedback from the second focus group, we developed the online systems training module (tutorial) and a program introduction designed to help users determine whether the program is appropriate for them and their child (introductory video, system requirements, terms of use, help). Information obtained from the second focus group was also used to inform our protocol for delivering the remote coaching portion of the program. We then piloted

the self-administered plus remote coaching version of the program with one family. Based on ongoing feedback obtained from this parent, we corrected program “bugs” and made small modifications to program content to increase clarity.

Specific Aim 2: Formatively evaluate the acceptability, usability and implementation feasibility of two delivery formats of the program to determine the most effective delivery method and use feedback to further refine the program

2a. Recruit participants (months 9-30). We will begin recruiting families to participate in the pilot study in month 9 of the project. We will aim to recruit 35 families with the expectation that some will not qualify or will choose not to participate. This will allow us to pilot a minimum of 15 families for each delivery format. Although we do not anticipate difficulty with participant recruitment, at this point in the study, we will examine our ability to recruit a sufficient number of families to complete the proposed study. If we find that we are having difficulty recruiting the anticipated number of families, we will change our recruitment strategies to include families living further from the research site and by connecting with additional agencies.

We began recruiting participants for this study in March 2012 and began enrollment in September 2012. Our response rate has been good. As of December 2013, we have enrolled 22 families and have a number of other families who have expressed interested in participating. We are on track for completing enrollment by July 2014.

2b. Conduct intake assessments and have families use and evaluate one of two delivery formats (months 12-33). We will conduct intake assessments for 30 families to collect demographic information and ensure participants meet inclusion criteria. Half of the families (15) will receive the self-administered modules only. The other half of the families will receive both the self-administered modules and remote, video-based coaching from a trainer. At the conclusion of their participation in the program, parents will complete measures of comprehension of program content and treatment acceptability/satisfaction. We will also assess parent program engagement and parent fidelity of implementation. These measures will be used to determine program acceptability, usability, and implementation feasibility.

We began intake assessment with our first cohort of participants in October 2013. As of December 2013, we have had 17 families complete the post-treatment assessments, 11 have also completed the 1-month follow-up, and 10 have completed all assessments points (pre-treatment, post-treatment, 1-month follow-up, 4-month follow-up).

These data will be used to assess the acceptability, usability, and feasibility of the self-administered only (SA-only) and the self-administered plus remote coaching (SA+RC) formats of the program. Below is a summary of our findings to date, based on the subset of participants for whom data has been scored for the pre- and post-treatment assessments.

Parent Program Engagement: Parent program engagement was measured using number of logins (n=14), overall amount of time online (n=14), number of lesson components completed (i.e., self-check questions, exercise, homework plans, reflection questions; n=17), number of additional program elements accessed (i.e., video library, forum, resources; n=17), and days to completion (n=17). Each of these measures was tracked electronically within the program. The number of remote coaching sessions completed by the parents in the remote coaching group was also tracked.

On average, parents logged into the program an average of 42.5 times (range 11-89). They spent, on average, 11 hrs:14 min on the site (range 4 hrs:7 min to 21 hrs:49 min). Parents completed 95.20 percent of all lesson components (range 66.2 to 100). On average, parents accessed additional program content 8.11 times over the course of the program (range 1-20). It took parents an average of 140 days to complete the program (range 85-205). Sixteen of seventeen parents (94%) were considered program completers (completed majority of components for 10 lessons or more), with only one parent discontinuing the program prematurely (after the sixth lesson). Parents in the coaching group completed all of the remote coaching sessions (24).

To examine whether program engagement differed as an effect of group, we ran a series of independent t-tests on the various measures of program engagement. Parents in the SA-only group logged in a significantly fewer times ($M=31.14$, $SE=4.27$) than parents in the SA+RC group ($M=53.76$, $SE=5.93$), $t(12)=3.11$, $p<.01$. They also spent less time interacting with the program content ($M=10\text{hrs}:59\text{min}$; $SE=2\text{hrs}:2\text{min}$) than the SA+RC group ($M=19\text{hrs}:3\text{min}$; $SE=1\text{hr}:25\text{min}$), $t(12)=2.57$, $p<.05$, and accessed additional elements less ($M=4.88$, $SE=1.06$) than the SA+RC group ($M=11.00$,

SE=1.99), $t(15)=2.62$, $p<.05$. It also took the SA-only group significantly more days to complete the program ($M=160.00$; $SE=14.42$) than the SA+RC group ($M=127.78$, $SE=13.53$), $t(15) = -1.66$, *n.s.* In contrast, there was no difference between groups in the percent of program components completed (SA-only: $M=91.90$; $SE=4.90$; SA+RC= 98.12 ; $SE=.70$), $t(15)=1.34$, *n.s.*

Taken together, these findings indicate that parents in both groups had a very high level of engagement with the self-administered program. Parents in the SA+RC group had greater program engagement on several metrics (number of logins, length of time on site, and number of additional elements accessed), which may have been a direct (i.e., using the site during coaching sessions) or indirect (i.e., increased motivation) effect of the coaching sessions.

Comprehension of Program Content: To examine whether parents increased their knowledge of the program content as a result of participating in the program, we examined changes on the *ImPACT Intervention Knowledge Quiz* from pre- to post-treatment ($n=17$). The *ImPACT Intervention Knowledge Quiz* is a 20-item, multiple-choice *Intervention Knowledge Quiz* that assesses curricular content. A mixed model ANOVA indicated that there was a main effect of time, with participants demonstrating greater intervention knowledge at post-treatment ($M=83.61\%$, $SE=3.40$) than intake ($M=71.40\%$, $SE=3.41$), $F(1, 13)=19.67$, $p=.001$. There was no main effect of group or group by time interaction, suggesting that both delivery formats are associated with similar gains in knowledge of key intervention concepts.

Parent Fidelity of Implementation: To examine the degree to which use of the program resulted in changes in parent behavior, the accuracy of the parents' use of the intervention techniques with their child was measured at pre-and post-treatment during a 10-minute parent-child play session and a snack using the Project ImPACT intervention Fidelity Checklist ($n=11$). Parents are given fidelity ratings on a 5-point scale in five areas: Makes Play Interactive, Models and Expands Language or Play, Increases Opportunities for Initiations, Helps Increase the Complexity of Language, Imitation, or Play, and Paces the Interaction. An Overall Fidelity score is calculated by averaging scores across the five fidelity

categories for the play and snack observation. An overall fidelity rating of 4 or greater is the standard for meeting fidelity of implementation.

A mixed model ANOVA indicated a main effect of time, $F(1, 9)=37.45$, $p<.001$, such that participants demonstrated greater fidelity of implementation of the ImPACT Intervention at post-treatment ($M=2.75$, $SE=1.08$) than pre-treatment ($M=1.61$, $SE=.66$). There was no significant main effect of group or group X interaction. However, there was a trend towards great gains in fidelity in SA+RC group ($M=2.07$, $SE=.36$) than the SA-only group ($M=1.14$, $SE=.37$).

Treatment Acceptability: The acceptability of the intervention procedures and the online delivery format of ImPACT Online program and the parents' overall satisfaction with the program were measured using the *Treatment Evaluation for Increasing Skills Scale* (TEISS; Berger, Mansten, & Ingersoll, 2013). The TEISS asks individuals to endorse 22 items that assess the acceptability of a treatment's procedures and its perceived effectiveness on a 7-point scale, ranging from 1 to 7, with higher scores indicating greater acceptability. TEIS has four empirically-derived subscales: Acceptability (9 items), Child Improvement (4 items), (Low) Burden (3 items), and Safety (6 items). Parents were also asked to rate the helpfulness of each component of the web-based program for learning the intervention. These items were combined into a Usability scale (11 items). Finally, parents were asked the degree to which they used the intervention with their child regularly and whether they would recommend the program to others. These two items were used as an overall measure of program satisfaction. Parents receiving the remote coaching component of the program were also asked to endorse 5 additional items that assessed parent satisfaction with the remote coaching and their relationship with their coach. All parents were also asked to make open-ended comments about benefits and limitations of the program and suggestions for improvement.

Parents rated the intervention presented in the program as highly acceptable ($M=6.51$, $SD=.70$), leading to improvement in their child's skills ($M=5.08$, $SD=1.44$), having a high degree of safety ($M=6.53$,

SD=.65) and having a low level of burden on the family ($M=5.67$, $SD=1.46$). Parents rated the self-administered portion of the program as highly usable ($M=6.31$, $SD=.64$) and parents in the SA+RC group rated the remote coaching component of the program as highly satisfactory ($M=6.76$; $SD=.66$). Overall program satisfaction was very high ($M=6.63$, $SD=.59$).

To examine whether treatment acceptability differed as an effect of group, we ran a series of independent t-tests on the various measures of measures. No significant group differences were observed for treatment acceptability, burden on family, safety, or usability, all $ps>.10$. However, parents in the SA+RC groups rated the intervention as leading to greater improvement in their child's skills ($M=5.81$, $SD=.95$) than the SA-only group ($M=4.14$, $SD=1.49$), $t(14)=2.73$, $p<.05$ and indicated greater overall program satisfaction ($M=6.89$; $SD=.07$) than the parents in the SA-only group ($M=6.29$, $SD=.29$), $t(14)=2.29$, $p<.05$.

Exploratory Analysis: We also ran an exploratory analysis to examine relationships between program engagement, changes in parent intervention knowledge, changes in fidelity of implementation, and treatment acceptability. Time spent on the site was positively associated with gains in intervention knowledge, $r(13)=.63$, $p<.05$ and overall treatment acceptability, $r(14)=.57$, $p<.05$. Overall treatment acceptability was also positively associated with changes in parent fidelity, $r(11)=.67$, $p<.05$.

Summary: Overall, our initial data analyses suggest that ImPACT Online is likely to achieve its aims. The program engagement data indicate high rates of program completion and low rates of attrition. Although parents in both groups had high rates of engagement in terms of program component completion, parents in the SA+RC group engaged more with the website. Parents in both groups also demonstrated significant improvement in conceptual knowledge of the intervention as well as fidelity of implementation of the intervention. Treatment acceptability ratings were also very positive for the intervention, the self-administered program, and the remote coaching. Overall satisfaction with the program was higher for the parents in the SA+RC group, suggesting that there may

KEY RESEARCH ACCOMPLISHMENTS

- We began the feasibility trial. We have enrolled 22 participants, 10 of whom have completed all phases of data collection.
- We have conducted preliminary analyses on data for the subset of participants who have completed pre- and post-treatment assessments.
- Key findings from the preliminary analyses of the feasibility trial include: 1) Parents demonstrate high rates of program engagement; 2) Program engagement is greater in the group who received remote coaching; 3) Parents demonstrate significant improvement in conceptual knowledge of the intervention from pre- to post-treatment; 4) Parents demonstrate significant improvement in their implementation of the intervention with their child from pre- to post-treatment; 5) Parents report a high degree of satisfaction with the program in terms of the acceptability of the intervention, usability of the self-administered program, and benefit of remote coaching; 6) Parents who receive remote coaching were significantly more satisfied with the program; and 7) Parent program engagement is related to changes in parent knowledge and treatment acceptability.

REPORTABLE OUTCOMES

My lab has conducted one presentation and published one article based on this project during the reporting period.

Ingersoll, B. (2013, October). An internet-based program to disseminate training in evidence-based autism intervention. Poster presentation at the Annual National Outreach Scholar Conference, East Lansing, MI.

We have developed the ImPACT Online program. We plan to use the program in additional research projects that can examine issues of program reach for which we have received IRB approval. We have submitted two grants to support this project (one internal grant that is under review and one to the Blue Cross Blue Shield of Michigan Foundation that was not funded). We also recently received a grant to the Institute Education Sciences in collaboration with researchers at Rady Children's Hospital in San Diego (PI: Stahmer) that would adapt the program content for use with toddlers with ASD. The ImPACT Online program would be used to present training in the intervention to *providers* who would then use the program with parents of toddlers with ASD. In addition, we developed a web-based application to present the ImPACT Online program. This application can be easily modified to present different material. We are currently using the application to deliver a different evidence-based parent training intervention for young children with autism (Online RIT), as part of a separate research project that is supported by a mentor-based fellowship from Autism Speaks, and have another grant to examine the intervention more broadly under review with Autism Speaks.

CONCLUSION

This project uses a newly-developed technology to disseminate an evidence-based parent-training intervention for children with ASD. Internet-based instruction is low cost and has the potential to surmount many barriers to participation in traditional parent training programs, including transportation and access difficulties, time limitations (internet-based instruction can be completed at any time of day), and lack of childcare. These aspects are likely to enhance the dissemination of effective intervention strategies to parents of children with ASD. Parents' use of these strategies can greatly increase the number of hours of evidence-based intervention their children receive and lead to increased generalization and maintenance of skills, positively impacting long-term functioning. We anticipate that the program will also have positive effects on parent mental health. Improvement in parent feelings of competence and child functioning will lead to increases in parents' optimism about their ability to influence their child's development and decreases in stress and depression.

Our preliminary analyses of our feasibility trial suggest that the two delivery models are feasible and lead to improvements in parent skill. Parents find the self-administered program highly engaging and easy to use; however, parent program engagement and satisfaction is higher when remote coaching is provided. As we collect data with additional participants, we will be able to fully analyze our data. This information will provide much needed information on the most effective methods for distributing the intervention to parents. If this approach to parent training is successful, it has implications for a wide range of remote training opportunities, including provider training, which will enhance the availability of high quality and efficacious intervention in areas which are currently underserved.